Seagrass monitoring in the Girringun TUMRA

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Why monitor seagrass in the Girringun TUMRA?

The Girringun TUMRA covers ~7,700 km² of Sea Country supporting diverse habitats including seagrass meadows, mangroves, and coral reefs. Northern Hinchinbrook Island also supports one of the Great Barrier Reef's dugong hotspots. Regular monitoring is essential to detect change, understand long-term trends, and support informed sea country management.

Background

Seagrass meadows are incredibly important. They provide food and habitat for dugongs and green turtles, a nursery for young fish, and keep the seabed stable. Seagrass can store carbon, which helps fight climate change. For the Djiru, Gulngay, Girramay, Bandjin, Warrgamay, and Nywaigi saltwater people in the Girringun TUMRA, seagrass meadows are culturally and economically significant.

This work is part of an ongoing collaboration between Girringun Aboriginal Corporation (GAC) Rangers working with researchers from TropWATER James Cook University (JCU) and the Northern Institute Charles Darwin University (CDU), to establish seagrass monitoring in the Girringun TUMRA.

The 2025 monitoring program builds on sites and drone skills developed through previous seagrass work, revisiting Lucinda and Cardwell and establishing a new site at Meunga Creek.

The 2025 surveys aimed to assess seagrass condition at these sites and detect change since 2024, against a backdrop of major flooding in early 2025 that is likely to have impacted seagrass across the region, particularly around Hinchinbrook Island.

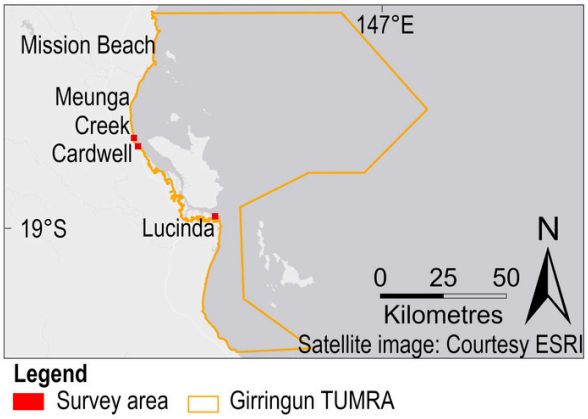




Marine and Coastal National Environmental Science Program
Great Barrier Reef Foundation
Girringun Aboriginal Corporation
Ranger Girringun Aboriginal Corporation
Girringun TUMRA
JCU
TropWATER
Charles Darwin University Australia

How we monitor

Intertidal seagrass monitoring was conducted in July 2025 using a *DJI Mavic 3 Enterprise* drone at Lucinda, Meunga Creek and Cardwell.



Two types of data were collected at each site: structured aerial imagery for orthomosaic generation, and spot-check imagery for ground-truthing.

Flight plans were run using *DJI FlightHub* at ~27 m altitude with 80% image overlap, producing very high-resolution imagery (~1 cm per pixel). This allowed seagrass to be detected where cover exceeded 5–10%, while keeping flights short enough to complete within a low tide window. Images were stitched together into orthomosaics using *Agisoft Metashape*. Seagrass area was drawn using visual interpretation of orthomosaics where cover was low (Cardwell and Lucinda), and through a machine learning model where cover was high (Meunga Creek).

Spot-check images were collected using the *Litchi* app, with the drone hovering ~1 m above the substrate pointing straight down. Up to 30 images were taken per site, cropped to a standard 0.25 m^2 area, and assessed for seagrass cover and species composition to validate the orthomosaic mapping.

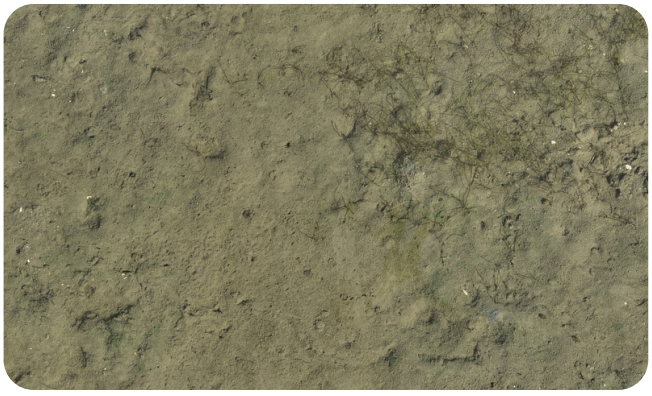
Seagrass cover, species composition, and seagrass area were compared between 2024 and 2025. Differences in seagrass presence between years were tested using Fisher's exact test, and differences in percent cover at seagrass-present sites were analysed using Gamma regression at Cardwell and Lucinda.



Pre-survey planning



Launching the drone



Seagrass spot check by drone

Making maps

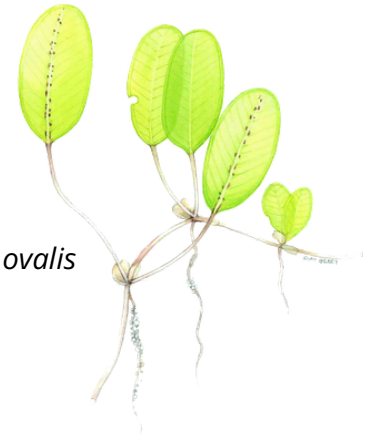
Survey data were entered into ArcPro (ESRI). Two spatial layers were created for each location:
(1) A survey site (point) shapefile for spot-check data, including seagrass presence/absence, seagrass cover and composition, and sediment type.
(2) A seagrass meadow (polygon) layer for extent, including meadow boundaries, community type, and mean seagrass cover.

What we found at Meunga Creek

2025 marks the first year of monitoring at Meunga Creek, selected based on large-scale mapping in 2022 that identified it as a substantial meadow with high numbers of dugong feeding trails.



Halodule uninervis



Halophila ovalis

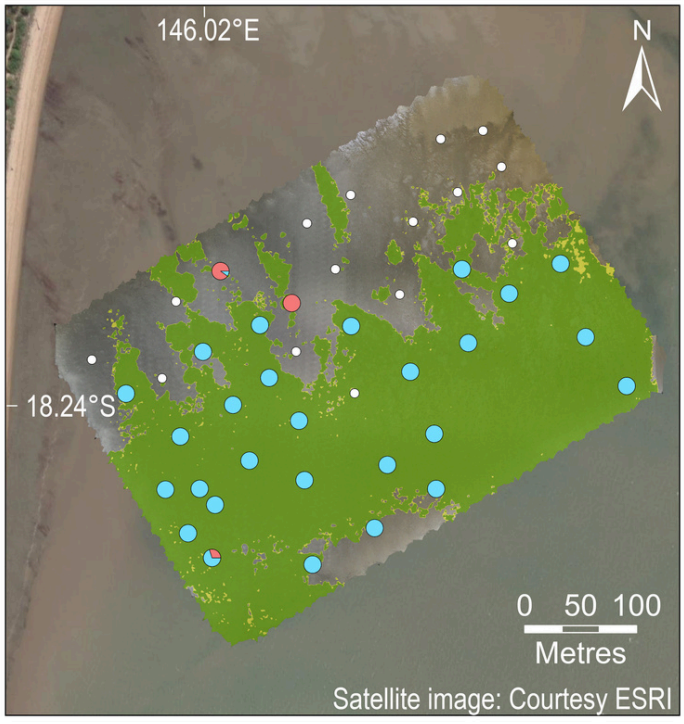
Seagrass cover and species

Seagrass was present at 29 of 45 sites (65%), dominated by *Halodule uninervis* (28 sites), with *Halophila ovalis* occurring at 3 sites on the inshore meadow edge. Cover ranged from 2 to 35%.

Seagrass area

In 2025, mapping recorded 9.6 ha with 90% confidence and 10.0 ha with 60% confidence. The seagrass area is dominated by *Halodule uninervis* with *Halophila ovalis*

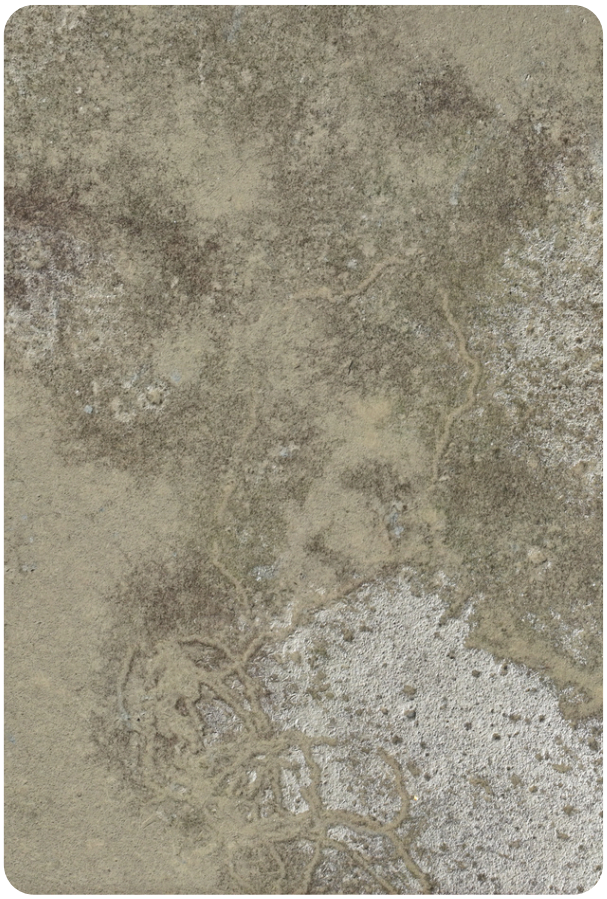
Dugong feeding trails were observed.



Legend

Seagrass species
- *Halophila ovalis*
- *Halodule uninervis*
- Seagrass absent

Seagrass meadow
- 90% probability
- 60% probability



Dugong feeding trails in orthomosaic

What we found at Cardwell

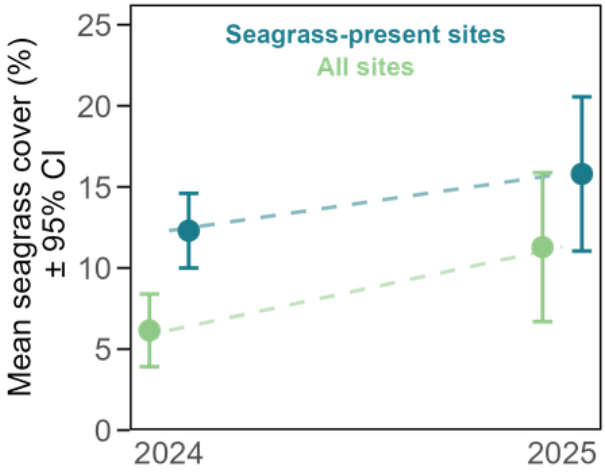
The Cardwell meadow was mapped in 2024 as part of the Cassowary Coast Green Nourishment Project, using a combination of drone and boat surveys across a larger area. The 2024 data were clipped to the 2025 survey boundary to enable direct comparison between years.

A total of 4.98 ha seagrass area was mapped within the drone survey area in 2025, slightly less than in 2024 when 6.11 ha was mapped.

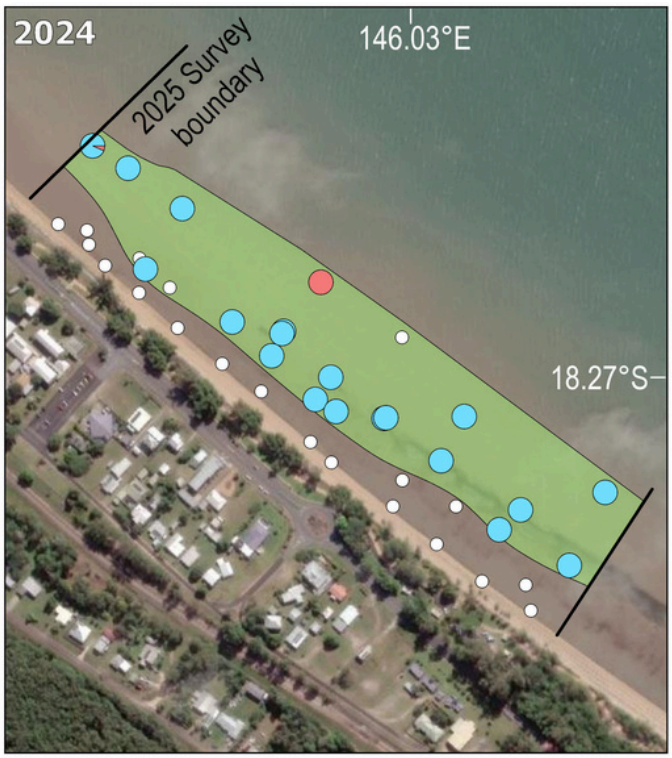
Halodule uninervis was the only species recorded in 2025. In 2024 the species *Halophila ovalis* was also present at one site.

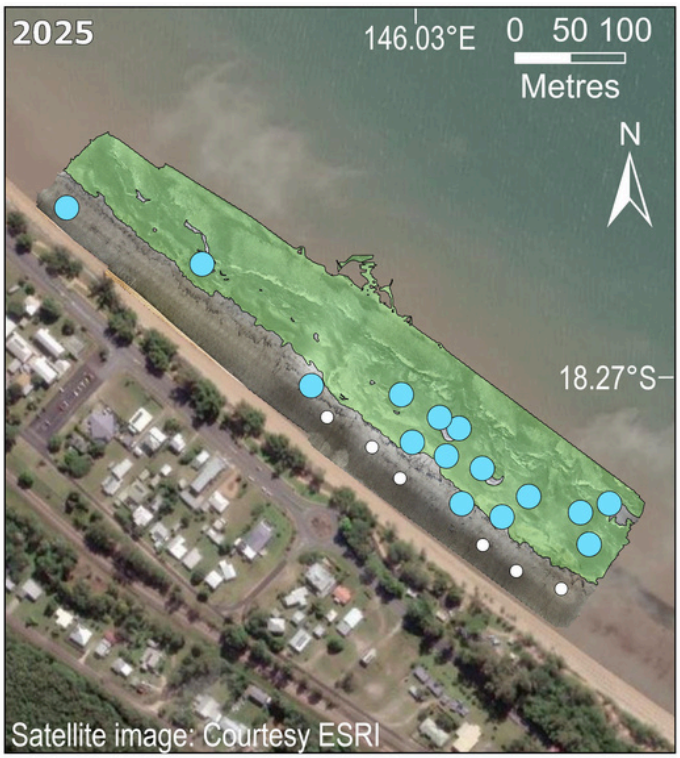
Seagrass was present at 20 of 40 sites (50%) in 2024, rising to 15 of 21 sites (71%) in 2025, though this difference was not statistically significant (Fisher's exact test, p = 0.173).

Mean cover at seagrass-present sites was 12.3% in 2024 and 15.8% in 2025 (dark blue in graph), with no significant difference between years (Gamma regression, p = 0.154). Cover ranged from 4–25% in 2024 and 2–30% in 2025.



Dugong feeding trails were observed in 2024 and 2025.





Legend

Seagrass species

- *Halophila ovalis*
- *Halodule uninervis*
- Seagrass absent
- Intertidal seagrass meadow

What we found at Lucinda

The Lucinda meadow was mapped in 2024 as part of the Blue Carbon Project using drones in the same area.

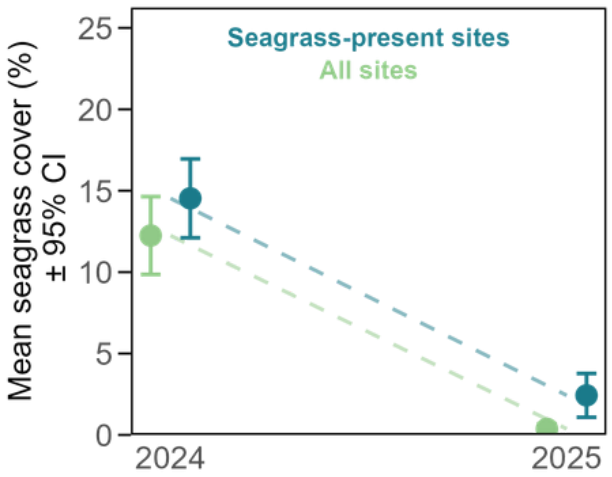
A total of 0.01 ha of seagrass was mapped at Lucinda in 2025, a dramatic decline from 6.45 ha recorded in 2024.

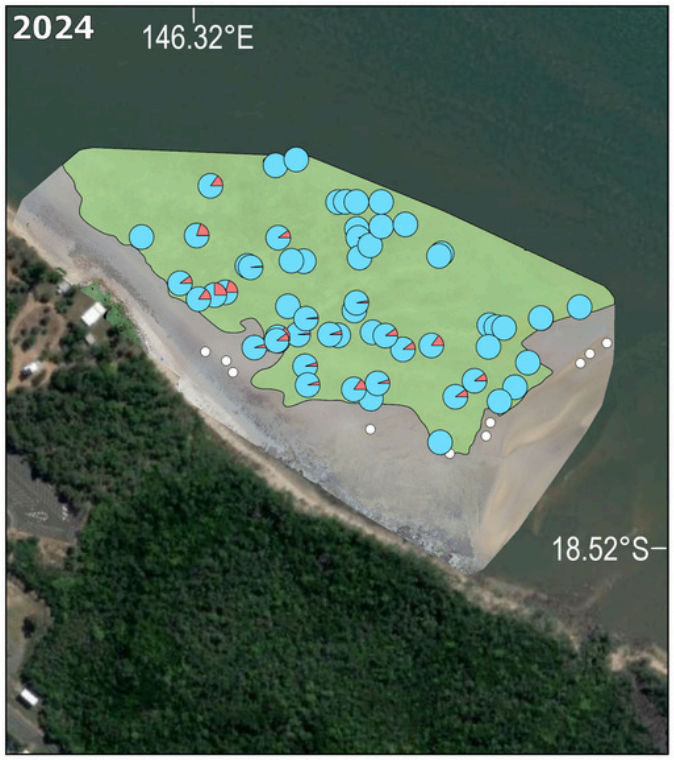
Halophila ovalis, which contributed approximately 5% of cover in 2024, was absent in 2025, with only *Halodule uninervis* recorded.

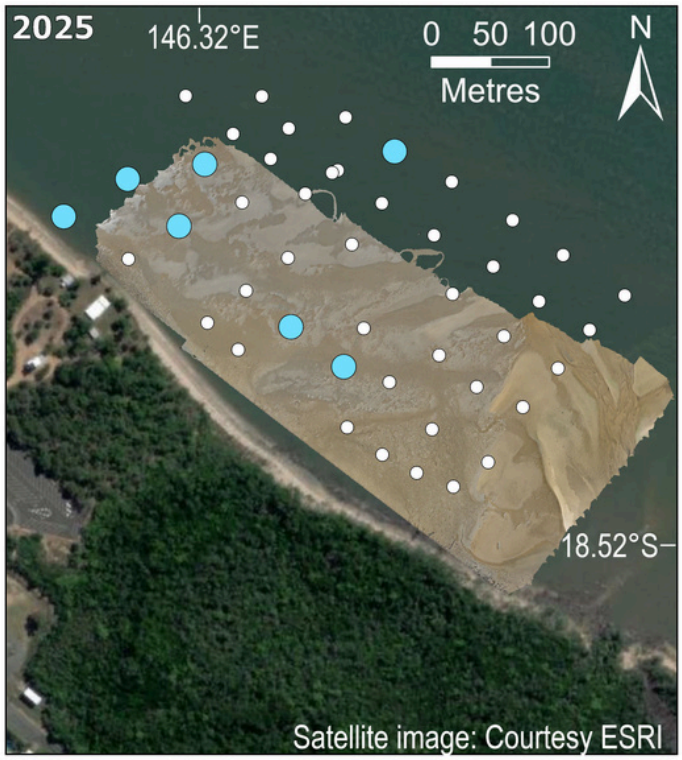
Seagrass presence declined significantly between years, from 59 of 70 sites (84%) in 2024 to just 7 of 46 sites (15%) in 2025 (Fisher's exact test, $p < 0.001$). The odds of seagrass being present were 97% lower in 2025 than 2024 (odds ratio = 0.035).

Dugong feeding trails were observed in 2024, but not in 2025.

Mean cover at seagrass-present sites declined significantly from 14.5% in 2024 to 2.4% in 2025 (dark blue in graph) (Gamma regression, $p < 0.001$), consistent with the near-complete loss of seagrass presence across the meadow. Cover ranged from 0.2–35% in 2024 and 1–5% in 2025.







Legend

Seagrass species

Halophila ovalis

Halodule uninervis

Seagrass absent

Intertidal seagrass meadow

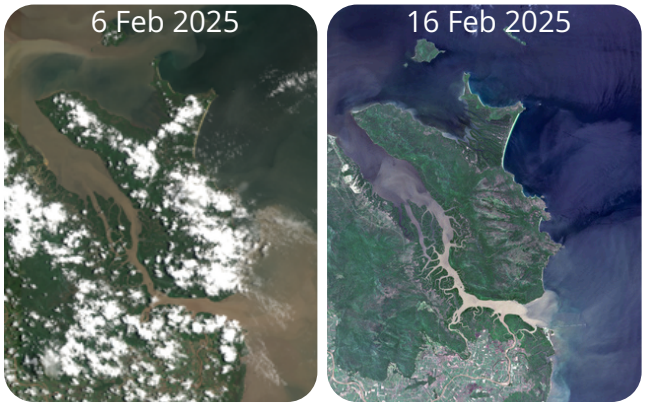
What does this mean for Sea Country ?

The 2025 monitoring represents an important step in building a long-term seagrass monitoring program in the Girringun TUMRA. With sites established at Lucinda, Meunga Creek, and Cardwell, rangers can now track changes in seagrass condition over time using drones.

The Hinchinbrook region is one of the most important dugong hotspots on the Great Barrier Reef, where seagrass meadows provide key foraging habitat for dugongs and green turtles, making the ability to detect and respond to seagrass change critical for sea country management.

The decline at Lucinda between 2024 and 2025 was severe, with seagrass presence falling from 84% to 15% of sites and meadow area contracting from 6.45 to 0.01 ha. *H. ovalis* was absent in 2025 at both Lucinda and Cardwell, significant because it is typically the first species lost following disturbance and less persistent than *H. uninervis*. The exceptionally wet 2024-25 season, the highest annual rainfall in 12 years for both the Murray and Herbert catchments with record falls in February 2025*, generated large flood plumes likely responsible for these impacts. Satellite imagery shows the plume persisted around Lucinda considerably longer than Cardwell, consistent with the greater severity of decline there. Flood-driven light reduction and sediment resuspension can suppress seagrass recovery for years, and the Lucinda decline closely mirrors losses recorded after Cyclone Yasi in 2011, suggesting flood events are a recurring threat in the TUMRA.

Dugong feeding trails were absent at Lucinda in 2025 despite being recorded there in 2024, while trails were present at Cardwell and Meunga Creek. Where seagrass has declined, remaining meadows become increasingly important as animals must travel further to forage. Continued monitoring is essential to track recovery and ensure Traditional Owners have the information needed to manage their Sea Country.



Recommendations

- Continue annual monitoring at Lucinda, Meunga Creek, and Cardwell during peak seagrass season (September–November), and expand to Taylors Beach and Goold Island to build TUMRA-wide coverage.

- Link seagrass monitoring to dugong and turtle habitat use, and include water quality measurements to help explain changes in seagrass condition.

Carter A, Bulmer D, Congoo S, Pryor J, Langlois L, Settli E, and Groom R (2026). Seagrass monitoring in the Girringun TUMRA. Fact sheet. Report to the Reef and Rainforest Research Centre, Cairns, Queensland.

Photos courtesy Styledia and TropWATER JCU

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*Wet Tropics Waterways 2026. Wet Tropics Report Card 2026 (reporting on data 2024-25). Waterway Environments: Results. Wet Tropics Waterways, Terrain NRM, Innisfail

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